

Terahertz Quantum Cascade Laser Local Oscillator, Phase II

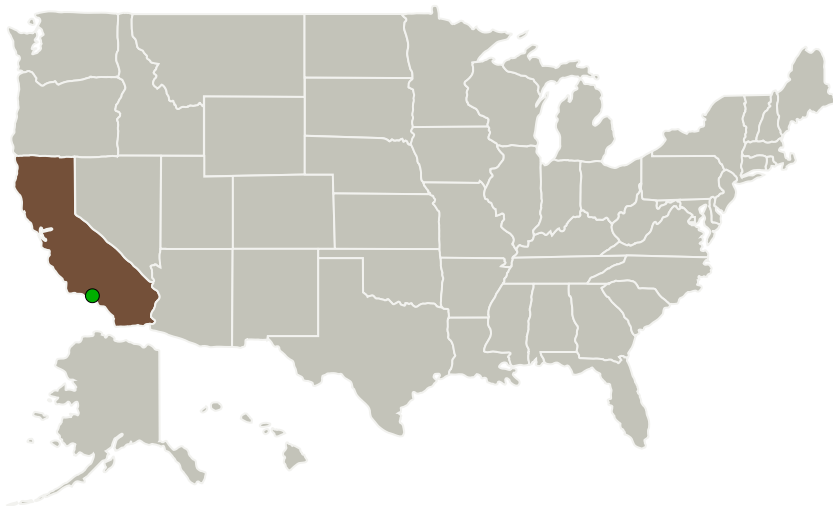
Completed Technology Project (2015 - 2018)



Project Introduction

NASA and NASA funded missions/instruments such as Aura (EOS CH-1)/MLS (Microwave Limb Sounder), SOFIA/GREAT and STO have demonstrated the need for local oscillator (LO) sources between 30 and 300 μm (1 and 10 THz). For observations >2 THz, technologically mature microwave sources typically have microwatt power levels which are insufficient to act as LOs for a heterodyne receivers. LongWave Photonics is proposing to develop a compact, frequency agile, phase/frequency locked, power stabilized, single mode quantum cascade laser (QCL) system with $> 2\text{mW}$ power output. The system includes distributed feedback grating (DFB) QCL arrays packed with multiple devices on a single semiconductor die with individual devices lasing at different frequencies. The source will be frequency agile over 150 GHz with center frequencies ranging from 2 to 5 THz range. The DFB QCL array will be packaged in a high-reliability Stirling cycle cooler. The source will be phase/frequency locked to a stable microwave reference synthesizer which allows continuous phase-locking ability over the THz laser tunable range with <100 kHz line width. The proposed system will be able to provide sufficient power for an LO at > 2 THz, with reduction of LO linewidth, and absolute frequency accuracy and with output power stabilized to reduce system noise. The whole system will be in a compact package which can be further reduced for a flight instrument.

Primary U.S. Work Locations and Key Partners



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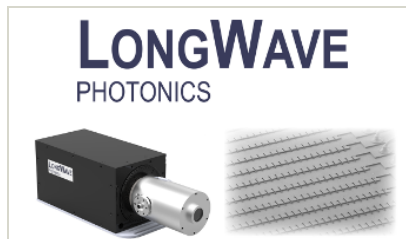


Organizations Performing Work	Role	Type	Location
LongWave Photonics, LLC	Lead Organization	Industry	Mountain View, California
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California

Images



Briefing Chart

Terahertz Quantum Cascade Laser Local Oscillator Briefing Chart
 (<https://techport.nasa.gov/image/133034>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

LongWave Photonics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

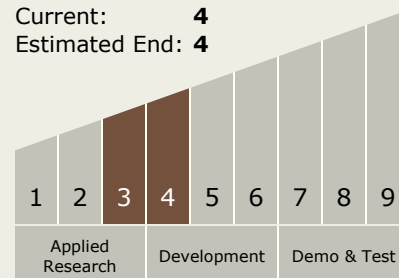
Carlos Torrez

Principal Investigator:

Alan W Lee

Technology Maturity (TRL)

Start: 3
 Current: 4
 Estimated End: 4



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.5 Lasers

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System